WELLINGTON
SHELL CLUB

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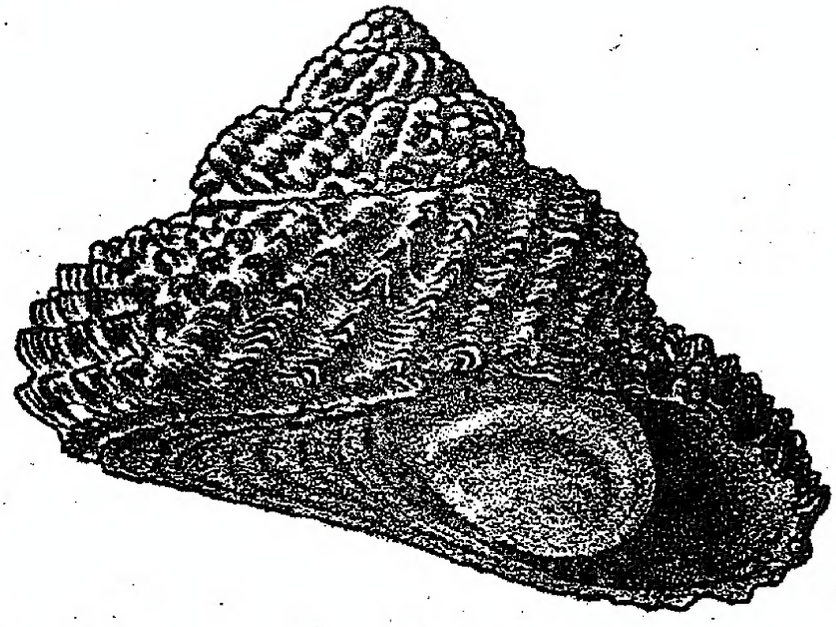

Journal of the Wellington Shell Club

New Zealand

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WELLINGTON SHELL CLUB

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In future notes on Study Groups, Field Trips, etc. will be issued three times per year in this new format. Contributions (preferably typed) from members will be accepted at any time.

Editor

J.T. RITZEMA
1A HUIA STREET
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WELLINGTON SHELL CLUB - FIELD TRIP TO CASTLEPOINT AREA
WEEKEND OF 8th NOVEMBER 1975

E. Andrews

Herein, I deal only with the morning of Sunday 9th when various members of the Club explored old Maori middens on the landward side of road between Whakataki and Mataikona.

The table below shows contents of 6 of these middens within a mile or two, numbering from Mataikone and to within a few hundred yards of stone cairn and plaque commemorating peace between two Maori tribes in 1839. These observations were made by Joan and Alan Beu, Jean Boswell and me and we welcome any additions from those members who were ahead of us.

In all middens examined we found oven stones, bird bones and cutting tools of obsidian or flint, usually the latter, and common to most of them were rabbit bones.

Middens

1	2	3	4	5	6	Shell Species
x	x	x	x	x	x	Cookia sulcata
x	x	x	x	x	x	Lunella smaragda
x						Mesodesma australa
x		x	x	x	x	Mesodesma subtriangulata
x	x	x		x	x	Cellana denticulata
x	x	x		x	x	Cellana radians
					x	Cellana ornata
				x		Radiacmea inconspicua
				x		Sigapatella novaezelandiae
x	x	x		x	x	Haustrum haustorium
x	x	x		x	x	Melagraphia aethiops
x	x	x	x	x	x	Scutus breviculus
x					x	Neothais scalaris
x	x	x	x	x	x	Cominella maculosa
	x		x	x	x	Argobuccinum tumidum
	x	x	x	x	x	Prototheca crassicosta
					x	Modelia granosa
	x	x		x	x	Haliotis iris
	x			x	x	Haliotis australis
			x			Struthiolaria papulosa
			x			Ostrea angasi
					x	Turritella sp. (probably M.roseus)
			x		x	Amalda mucronata
		Traces	x	x		MOA BONES
			x	x		MOA EGG SHELL FRAGMENTS

Note of interest and conjecture - no mussel shells found!

CASTLEPOINT COLLECTION

Close to L.T.

NO	NAME
1.	Cantharidus-opalus. L.
2.	" -purpureus.L.
3.	Micrelenchus-dilatatus.L.
4.	Cantharidella-tesselata. L.
5.	Melagraphia-aethions. L.
6.	Zediloma-atrovirens. L.
7.	Anisodiloma-lugubris. L.
8.	Trochus-viridis. D.
9.	" -tiaratus. D.
10.	Zethalia-zelandica. D.
11.	Baryspira-australis. D.
12.	" -mucronata. D.
13.	Patelloida-corticata-corallina.L.
14.	Melarhapha-oliveri. L.
15.	" -cincta. D.
16.	Paratrophon-stangeri. D.
17.	Axymene-corticatus. D.
18.	Rynella-impacta. L.
19.	Tawera-spissa. D.
20.	Notocorbula-zelandica. D.
21.	Leptomya-retiaria. L.
22.	Cardita-aoteana. D.
23.	Zegalerus-tenuis. L.
24.	Maoricrypta-monoxyla. L.
25.	Spisula-aequilateralis. L.
26.	Zearcopagia-disculus. D.
27.	Penion-adusta. L.
28.	Austrofusus-glans. D.
29.	Cominella-maculosa. L.
30.	Xenophalium-pyrum. D.
31.	Maurea-punctulata ? D.
32.	Modelia-granosa. D.
33.	Cookia-sulcata. L.
34.	Lunella-smaragda. L.
35.	Cellana-ornata.
36	Buccinulum-lineum. D.
37.	Ischnochiton-maorianus. L.
38.	Amaurochiton-glaucus. L.
39.	Argobuccinum-tumidum. L.
40.	Haustrum-haustorium. L.
41.	Neothais-scalaris. L.
42.	Lepsiella-scobina. L.
43.	Perna-canaliculus. L.
44.	Aulacomya-maoriana. L.
45.	Modiolus-neozelanicus. L.
46.	Protothaca-crassicosta
47.	Anchomasa-similis. D.
48.	Cellana-radians-flava. L.
49.	Haliotis-iris. D.
50.	Rissoina-chathamensis. D.
51.	Herpetopoma-benthocola.
52.	Leptomya-retiaria.
53.	Pervicacia-tristis.
54.	Asteracmea-suteri.

There were other Patellidae, Chitonidae, Muricidae, Thaisidae, Buccinulidae, and Turridae, so I will leave them to some of the other members to fill in.

Jean Boswell

NEW ZEALAND CASSIDAE

Study group, by A.G. Beu, 25 September 1975

Family Name: A family Cassididae has been used twice (once based on Cassida, a beetle) so the International Commission on Zoological Nomenclature has satisfied the usage of Cassidae for the molluscan family.

Classification: Two subfamilies of cassids can usefully be recognised. Subfamily Cassinae contains species with a weakly twisted siphonal canal, and consequently a weakly developed siphonal fasciole, and an oval operculum with a nearly central nucleus. Subfamily Phaliinae contains species with a strongly twisted siphonal canal, causing a prominent fasciole separated from the last whorl by a deep groove , and a fan shaped operculum with the nucleus in the centre of the left edge, against the columella. All New Zealand Cassids belong in the latter subfamily Galiodea.

Subfamily Cassinae

Genus Galeodea Link, 1807

The only New Zealand living species is Galeodea triganceae Dell, 1953, a species from deep water (ca.200 - 800 m) all around New Zealand. Recognisable by its small size, several rows of small,sharp nodules, elongate shape, thin outer lip, and lack of fasciole.

An undescribed species of Galeodea (Galeoocorys) occurs in New Zealand waters, although the New Zealand Oceanographic Institute's single live-collected shell may be the only specimen known so far; possibly the same as an unnamed species from the Castlecliff beds, Wanganui.

Subfamily Phalinae

Powell (1962, Shells of N.Z.") lists 11 species of the Xenophalium group from New Zealand, and has added 2 more records in recent years. Tucker Abbott has greatly modified this list towards biological reality in his article Cassids of the World in "Indo-Pacific Mollusca", but in my opinion he didn't arrive quite at the true relationships of New Zealand species, so I suggest a slightly different arrangement.

Genus to be used for the common New Zealand cassids:

New Zealand's main group of cassids was placed in Phalium (Xenophalium) by Abbott. Species of this group appear as fossils in New Zealand suddenly in Nukumaman (early Pleistocene) rocks and have no known ancestors in the fossil record of the Southern Hemisphere. However, the European Miocene and Pliocene fossil species Semicassis laevigata (defrance) and Semicassis miolaevigata Sacco are very similar to New Zealand species of the "xenophadium" pyrum group, and have characters intermediate between those of pyrum and those of labiata, and in my opinion they are the direct ancestors of the Southern Hemisphere smooth

cassids. Cassids are widely distributed, so probably have long-lived planktonic larvae as do the cymatiids and bursids, so to me it's not at all surprising to find that, as with many of our cymatiids, the common New Zealand recent cassids arrived only as recently as early Pleistocene time from Europe. The European fossil species are smooth but are regarded as the ancestor of the strongly-spiralled, typical Semicassis, S.saburon (Bruguiere), and as New Zealand "smooth" species all bear strong spiral grooves when they're young, it seems to me that Xenophalium should be synonymised with Semicassis.

Valid New Zealand species of Semicassis are:

S. royana (Iredale) - This was treated as a subspecies of pyrum by Abbott, but in my opinion that can't be correct as the much larger and more strongly noduled, heavily built shells of S.royana partly overlap the geographic range of pyrum, which is not genetically possible for a subspecies, so it has to be a full species. S.royana can always be distinguished from S.pyrum by its very large size, tall spine, very thick shell, large nodules on most specimens, and much more strongly reflexed outer lip. Trawled uncommonly off eastern Northland, and occurs also at the Kermadec Island and in East Australia.

S.pyrum (Lamarck) - (= abernethyi Dell, = finlayi Iredale, = hamiltoni powell, = harrisonae powell, = matai powell, = powelli Finlay). The abundant small, rounded species throughout New Zealand from Northland to the Snares Islands, and in south-eastern Australia. The shell is thin; the spine low, the lip little reflexed, the inner lip has a wide, straight-edged callous shield and there is a wide groove between the siphonal fasciole and the last whorl. Highly variable in colour pattern, strength of nodules, number of spiral grooves, shell thickness, strength of teeth inside the outer lip, and prominence of ridges on the inner lip.

S. thomsoni (Brazier) - Recently recorded from New Zealand by Dr Powell, known only rarely from East Northland, and occurs also in south-eastern Australia. A distinctive species with a keel around the shoulder, relatively prominent spinal sculpture, a notch in the outline of the inner lip callus, and a colour pattern of red squares around the shoulder.

S. labiata (Perry) - A relatively uncommon species with an elongate, smooth shell, a thickened and strongly reflexed outer lip usually bearing prominent teeth inside, the inner lip callus spread smoothly down over the last whorl and fasciole instead of raised into the callous shield seen in S.pyrum, and with a very narrow groove between the fasciole and the last whorl. Occurs from Northland to the Bay of Plenty only, and in eastern Australia. Two ecological forms occur: typical labiata, lacking shoulder nodules and often darker in colour, lives in sand patches around rocks; and collactea (Finlay) (= Iredale, based on Australian forms), a paler form with a few nodules on the last whorl, living off open-ocean sand beaches, but intergrading completely with labiata.

Genus Casmaria

Represented in New Zealand by the small C. ponderosa perryi (Iredale) only, recently recorded from eastern Northland to Great Barrier Island by Dr Powell. Has the same geographic range as Semicassis royana, and is a geographic subspecies of a species with forms throughout the Indo-Pacific (according to Tucker Abbott). Recognisable by its small size, smooth surface, long narrow shape with narrow aperture, very narrowly reflexed outer lip, and colour pattern of large chestnut blotches on a pale brown background.

So the seven species of cassids known from New Zealand are:

Galeodea

triganceae Dell
(Galeoocorys) n.sp. (unnamed)

Semicassis

labiata (Perry)
pyrum (Lamarck)
royana (Iredale)
thomsoni (Brazier)

Casmaria

ponderosa perryi (Iredale)

THE LARGER NEW ZEALAND PECTINIDAE

Study group, F.M. Climo and A.G. Beu, 23.10.75

Lately it has been realized that there are at least 5 species of Cyclopecten, and that they need to be examined by S E M (scanning electron microscope) to differentiate them so we won't consider these tiny pectinids here.

Genus Chlamys Roding, 1798

Type species: islandicus Mueller, N. Atlantic

Subgenus Mimachlamys Iredale, 1929.

Type species: asperrimus Lamarck, southern Australia.

Several authors (notably Stearns MacNeil, 1967, "Cenozoic Pectinids of Alaska, Iceland and other Northern Regions" U.S. Geol. Surv. Professional Paper 553, p.2.) have pointed out that "The comparatively narrow boundaries of diversification within the Pectinidae make it likely that similar morphological types evolved again and again, "because pectinids are successful and numerous, and all are adapted to the free-swimming mode of life which necessitates a straight hinge-line for valve flapping axis, hingeward directed margins of the disc to control direction of swimming, and thus lateral ears to extend the hinge line beyond the narrow dorsal area of the disc. A great many species of different ancestry conform to the basic plan of the largest genus, Chlamys, adapted (in at least the smaller forms) to byssal attachment or free-swimming, at the will of the individual; i.e., they can rest bysally attached, but swim away from predators. There can be no doubt that the Australian and New Zealand species

of "Chlamys" evolved separately from the C.islandicus group, and therefore should be placed in a different subgenus. Iredale has proposed Mimachlamys for Australian species with prickly to scaly sculpture on the ribs, very similar to that of our smaller species, and Mimachlamys seems to be a suitable subgenus to include the New Zealand shells similar to typical Chlamys.

Valid species are:

C.(M.) zelandiae (Gray, 1843)
(= celator Finlay, = dieffenbachi Reeve, = suprasilis Finlay, = s.crepusculi Fleming, = zeelandona Hertlein).

The common species in shallow water all around New Zealand, occurring from the intertidal zone to the continental shelf in about 100 m. Ribs and colour pattern very variable; usually with relatively large scales or spines on the ribs, and many fine, coarsly spined, intermediate ribs between the main ones. Colour most usually purple to brown. Specimens with small, even spines, known as typical zelandiae can be free or thinly encrusted with sponge; large specimens with narrow ribs and long spines, thickly encrusted with sponge, are known as dieffenbachi (=celator); free-living specimens from hollows, lacking spines and with wide, smooth ribs, are known as suprasilis; and any of these forms bearing alternating radial light and dark colour bands are known as zeelandona. Specimens changing halfway down the disc from the suprasilis form to the dieffenbachi form are common, presumably showing the size the shell reached when sponge started to grow on it.

C.(M.) dichroa (Suter, 1909) (= taiaroa Powell, 1952) -

An uncommon species from eastern South Island to Stewart Island. Pale to bright orange only, often marbled light and dark orange, with narrow (form taiaroa) to very broad (typical dichroa) radial ribs bearing many closely spaced , short, overlapping scales, and with few or no intermediate ribs. Found only on the continental shelf from about 40 to 150 m, and in the shallower part of its depth range is often taken with zelandiae and gemmulata. The limited distribution, consistently orange colour, different rib surface ornament and the frequent occurrence with typical zelandiae strongly suggest this is a different species from zelandiae.

C.(M.) gemmulata (Reeve,1853) -

An easily recognised, very finely sculptured, little-inflated species usually thinly encrusted with sponge, occurring all around New Zealand in depths of 20 to 500 m. A weakly differentiated southern geographic subspecies with finer sculpture, larger size and flatter shell is C.gemmulata radiata (Hutton), and a form with more prominent ribs in the far north of New Zealand (notably around the Three Kings Islands) is consociata Smith, possibly to be regarded as a third geographic subspecies.

C.(M.) kiwaensis (Powell, 1933) -

A poorly known form from deep water, resembling gemmulata in sculpture but lacking intermediate riblets between the primary ribs, always 15 mm high or smaller, and always markedly shorter than high and so probably a distinct species; all from deep water (200 - 1500 m) bysally attached to hard objects.

Subgenus Zygochlamys Shering, 1907
Type species: geminata Sowerby, upper Miocene, Chile.

A scarcely recognisable group of one or two species differing from Mimachlamys only in min minor details of shape and ribbing; a little lineage of Mimachlamys that lost the use of the byssal notch in the adult stage as it evolved. The straight lateral edges of the disc are unusually short and widely angled and the lower rounded margin is unusually expanded, and the radial ribs are weakly spined, much subdivided, and usually rounded in cross section.

C.(Z.) delicatuta (Hutton, 1873) -

Joan Beu's work on Zygochlamys suggests that delicatula is merely a geographic subspecies of the South American living C.(Z.) patagonica (King), differing in its slightly coarser ribs lacking the red colour they (but not their interspaces) usually show on South American shells. In New Zealand it lives in deep water (80 to at least 600 m), mostly below 200 m, from Otago Peninsula south to the Auckland Islands, Campbell Island and Macquarie Island. Easily distinguished from other New Zealand Chlamys by its shape, its large size (although smaller than many Australian Mimachlamys), almost smooth ribs, and one valve being quite birghtly coloured (pink or yellow) whereas the other is white.

Genus Mesopeplum Iredale, 1929
Type species: caroli Iredale, E. Australia.

Pallium is not an available name for this group as it is a synonym of pecten (sensu stricto).

Mesopeplum is a good genus to include the Australian and New Zealand relatives of the Indo-Pacific. Decatopecten group, having a small number of large radial folds, and the right valve more inflated than the left (the opposite of the Chlamys group of genera). Decatopecten differs in its prominent hinge crura on the ears.

M. convexum (Quoy and Gaimard, 1835) -

Quite common below about 40 m all around New Zealand to about southern South Island, and quite commonly dredged alive off Island Bay, etc., around Wellington. Easily recognised by the large number of small radial riblets on the five large radial folds, but details of shape and sculpture vary enormously.

Genus Delectopecten Stewart, 1930
Type species: vancouverensis Whiteaves, Recent, Alaska to California.

D. fosterianua (Powell, 1933) -

A thin-shelled, translucent white, almost smooth shell from deep water (ca. 100 - 1500 m), easily recognised by the ears of the posterior ends of both valves not being separated from the central disc; reaches about 25 mm high.

Genus Parvamussium Sacco, 1897
Type species: duodecimlamellatus Broun, Miocene, Italy

P.Maorium Dell, 1956 -

Another thin-shelled, translucent, exteriorly smooth, deep water species, easily recognised by having many thick radial ribs inside the shell, not reaching the outer edge of large specimens, and by its orange colour; reaches about 40 mm high.

Genus Pecten Muller, 1776
Type species: maximus Linnaeus, Europe

The common, well-known scallop with the left (upper) valve flat to concave and the right (lower) valve strongly convex, and with ears almost equal, lacking a byssal notch. The situation has been described clearly by Dr Fleming (1957, "The Genus Pecten in New Zealand", N.Z. Geol. Surv. Paleont. Bull.26) and need only be summarised here.

P. novaezelandiae novaezelandiae (Reeve, 1853) -

The northern form is more brightly coloured, slightly smaller, and has more rounded radial ribs than the southern form. Common throughout the northern South Island to northern North Island rarely intertidally (in northern harbours) down to about 100 m on the continental shelf. Intergrades completely, through a gradual cline with -

P. novaezelandiae rakiura Fleming, 1951 -

The southern form, typically found at Stewart Island, has ribs of much more nearly square cross-section than in P. n. novaezelandiae, and bears numerous fine transverse lamellae in the rib interspaces that are absent from the northern form, and sometimes bears weak grooves down the main radial ribs that are rarely, if ever, seen on the northern form. Common at Stewart Island, especially in Patterson Inlet. Specimens of this form occurred markedly further north during late Pleistocene glaciations (e.g. to Whitianga, Coromandel Peninsula) and the occurrence of similar living populations in a few North Island harbours (notably Manukau) has been attributed to the trapping of populations of the southern form in the harbours, although it seems equally likely to be merely an ecological effect (as with Alcithoe arabica populations).

LIST OF N.Z. PECTINIDAE

Pecten

novaezelandiae novaezelandiae Reeve
novaezelandiae rakiura Fleming

Chalmys (Mimachlamys)

dichroa (Suter)
gemmulata gemmulata (Reeve)
gemmulata radiata (Hutton)
gemmulata consociata (Smith)
Kiwaensis Powell
zelandiae (Gray)
zygochlamys)
delicatula (Hutton)

Mesopeplum

convexum (Quay & Gaimard)

Delectopecten

fosterianus (Powell)

Parvamussium

maorium Dell

Cyclopecten (Cyclochlamys)

5 ± spp., minute, colourless, sculpture usually different on the two valves.

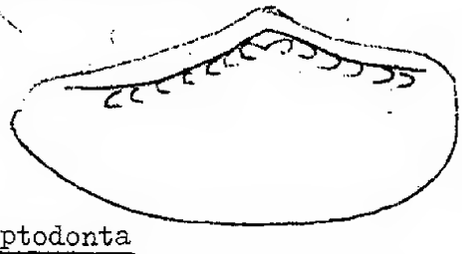
AN OUTLINE OF BIVALVE CLASSIFICATION

A.G. Beu

Part of a talk given to Shell Club on 25 July 1974, based on Vol. 6 (Bivalvia) of "Treatise on Invertebrate Paleontology".

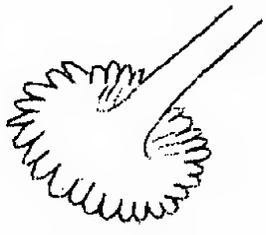
1. Subclass Palaeotaxodonta

Includes only the Order Nuculoida, bivalves with a taxodont hinge, now all specialised for feeding by sediment sorting with their greatly enlarged labial palps. All have nacreous shells, and a hinge with a long row of similar teeth.



2. Subclass Cryptodonta

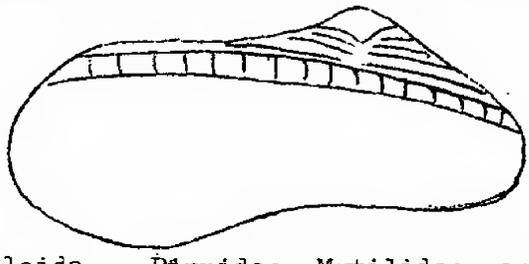
Of living bivalves, includes only the Order Solemyoida, with thin, flexible largely chitinous shells, no hinge teeth, and a large, umbrella-shaped foot specialised for burrowing in deep, soft mud.



3. Subclass Pteriomorphia

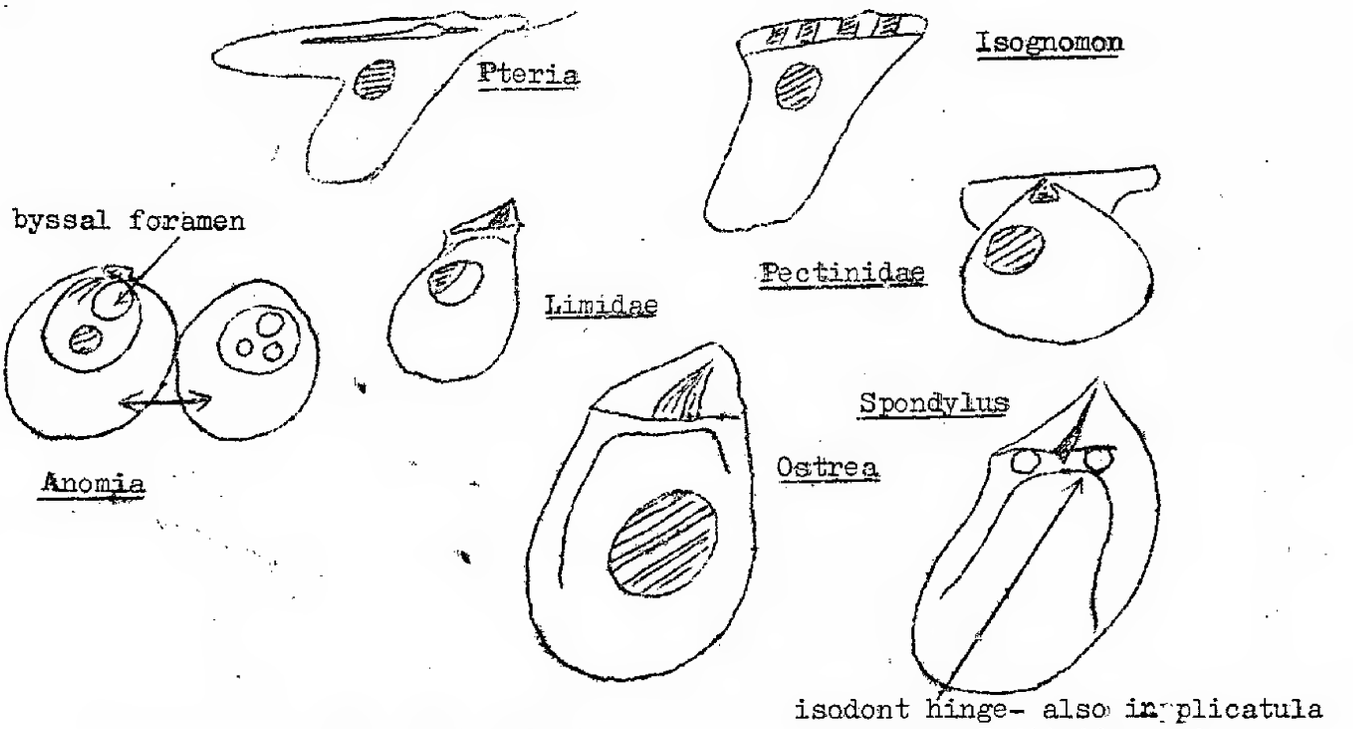
Includes three orders -

(a) Order Arcoida - Arcidae, Glycymerididae, Limopsidae, Cucullaeidae, etc. All have a taxodont hinge, with a ligamental cardinal area above the teeth and below the umbo; shells porcellaneous in structure, and usually rounded and inflated, with weak radial sculpture.



(b) Order Mytiloida - Pinnidae, Mytilidae, and extinct groups - weak (dysodont) or absent hinge, elongate nacreous shells, and bysally attached life habit.

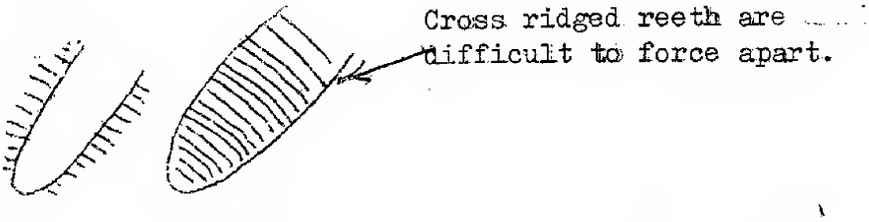
(c) Order Pterioida – Contains superfamilies Pteriacea, Ostreacea, Limacea, Pectinacea, Anomiacea and many extinct groups. Shells are calcitic and of nacreous or prismatic structure (or both), monomyarian (one adductor muscle only) or heteromyarian (adductor scars of markedly different sizes), with moderate sized to large ears (auricles) on the hinge-line, and no hinge teeth, or an isodont hinge (two similar teeth and sockets on each valve), or weak accessory teeth below the ligamental area in some extinct groups; bysally attached or cemented to rocks when adult.



4. Subclass Paleoheterodonta –

Of living bivalves, includes only the Trigoniidae and the freshwater Unionacea - have dimyarian (2 muscle scars about the same size) nacreous shells, with elaborate hinges –

Negtugonia



5. Subclass Heterodonta -

(a) Order Veneroida - Many groups of small bivalves (Leptonacea, etc.) plus Carditacea, Lucinacea, Crassatellacea, Cardiacea, Mactracea, Tellinacea, Veneracea, etc. - shallow - burrowing "normal" bivalves, with strong, porcellaneous, dimyarian shells, elaborately differentiated teeth on a strong hinge and consequent reduction of the ligament.

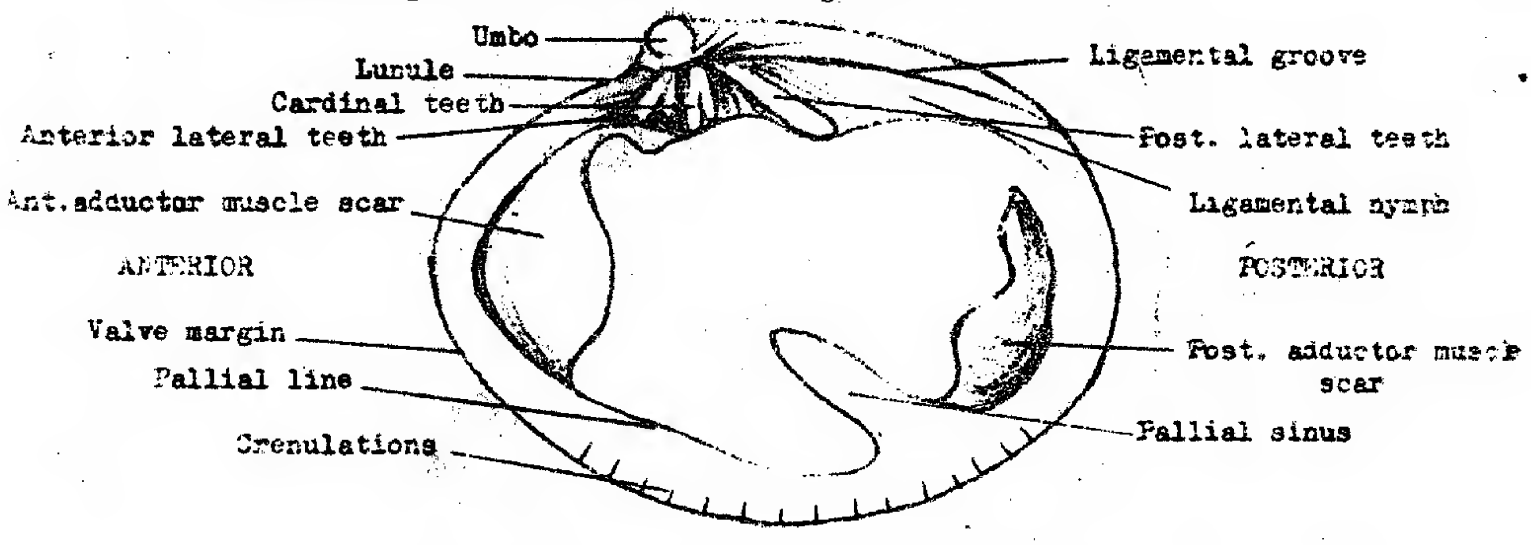


Diagram of a Venerid (Superfamily) Veneracea)

(b) Order Myoida - Hinge degenerate, usually with teeth small or absent; most are thin-shelled, deep-burrowing forms with a prominent internal ligament resilifer (called a chondrophore) below the hinge plate, and with porcellaneous, dimyarian shells - Myidae, Gastrochaenidae, Hiatellidae, etc. and the highly specialised wood-and-rock-boring Pholadacea - families Pholadidae and Teredinidae.

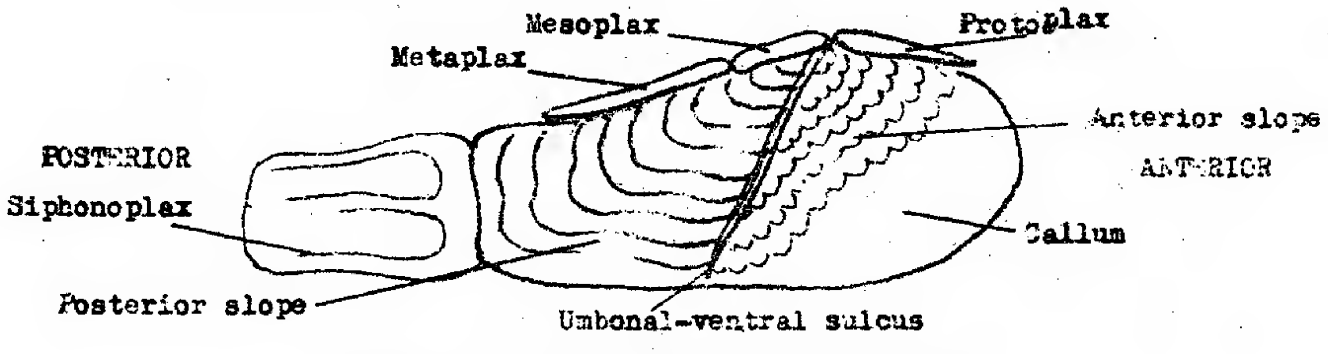


Diagram of a pholad (family Pholadidae)

6. Subclass Anomalodesmata

Includes only Order Pholadomyoida - nacreous, with no hinge teeth; nestling and burrowing forms (one genus cemented to rocks), with dimyarian muscle scars, and large internal or external ligaments - includes families Pholadomyidae, Myochamidae, Pandoridae, Cleidothaeridae, Laternulidae, Periplomatidae, Thraciidae, Verticordiidae, Cuspidariidae, Clavagellidae, etc., and many extinct groups - an ancient group of bivalves which never had a hinge, rather than losing it secondarily as in the Myoida.

Glossary of Terms used in the
description of Gastropods.
Compiled by Joan Bea

Gutter - Groove or canal at posterior extremity of aperture, in some gastropods marking location of anal outlet.

Height - Distance between two planes perpendicular to shell axis and touching adapical and abapical extremities of shell or part being measured; this definition does not apply to Bellcrophontacea or Cypraceacea, in which established practice differs.

Helicocone. Distally expanding coiled tube that forms most gastropod shells.

Heterostrophic - Condition of protoconch when whorls appear to be coiled in opposite direction to those of teleconch.

Holostomatous - With apertural margin uninterrupted by siphonal canal, notch, or by other extension.

Hyperstrophic - Spire depressed instead of elevated; a hyperstrophic dextral shell may be identical in form to an orthostrophic sinistral shell, and a hyperstrophic sinistral shell like-wise may correspond to an orthostrophic dextral shell; identification is based on organization of soft parts.

Immersed - Condition of initial whorls when sunk within later ones and concealed by them.

Impressed - Condition of suture having both adjoined whorl surfaces turned inward adaxially.

Inductura - Smooth shelly layer secreted by general surface of mantle, commonly extending from inner side of aperture over parietal region, columellar lip, and (in some genera) part or all of shell exterior.

Inner lip - Margin of aperture adjacent to the next-to-last whorl; may include parietal lip and columellar lip.

Involute - Outer whorls slightly to strongly embracing inner whorls but not completely.

Keel - Prominent spiral ridge (see carina).

Labial area - Flattened or callus-coated surface extending from inner lip.

Larval shell - Hard parts of pelagic larva before it settles down and undergoes metamorphosis.

Last whorl - In coiled shells, last-formed complete volution of helicocone.

Left - Side of shell closest to left side of head-foot mass when this is extruded and active; side on left when shell is oriented with aperture facing observer and apex upward, except in depressed and discoidal shells.

Lira - Fine linear elevation on shell surface or within outer lip.

Lunula - Crescentic linear ridge on selenizone, concave toward aperture.

Multispiral - With numerous whorls.

Neck - Constricted anterior part of body whorl of some gastropods, exclusive of canal.

Nucleus - Earliest formed part of shell or operculum; this term preferably should not be used for juvenile shell designated as "protoconch".

Obconical - Reversed-cone shape, base strongly conical and spire nearly flat.

Operculum - Horny or horny-calcareous plate carried on posterior part of foot, used to close aperture when gastropod withdraws into its shell.

Operculate - With an operculum.

Ornament - Relief pattern on surface of many shells.

Orthostrophic - Spire slightly to strongly elevated.

Outer lip - Abaxial margin of aperture extending from suture to foot of columella.

Ovoid - Egg-shaped, apical and basal parts of shell somewhat evenly rounded.

Parietal Fold - Spirally wound ridge on parietal region that projects into shell interior.

Parietal lip - Part of inner lip which adjoins next-to-last whorl.

Parietal Region - Basal surface of helicocone just within and just without aperture; the redundant expression "parietal wall" should not be used,for "parietal" signifies pertaining to wall.

Parietal Ridge - Protuberance from parietal lip near adapical corner of aperture.

Patelliform - Low cap-shaped, like shell of Patella, noncoiled.

Paucispiral - With relatively few whorls.

Periostracum - Coat of horny material (conchiolin) covering calcareous shell at least during some part of growth.

Periphery - Part of shell or any particular whorl farthest from axis.

Peristome - Margin of aperture.

Planispiral - Coiling in a plane,with part of shell on one side of a plane the mirrow image of other.

Plication - Spirally wound ridge on interior of shell wall (see fold).

Posterior - Direction backward from head of gastropod, in spiral shells toward apex.

Protoconch - Apical whorls of shell, especially where clearly demarcated from later ones.

Pseudumbilicus - Depression or cavity in shell base affecting only last whorl, and therefore not a true umbilicus; sometimes termed false umbilicus.

Pupaeform - Elevated ovoid, like shell of Pupa, in which late-formed whorls have decreasing radii of curvature.

Ramp - Sloping surface of a whorl next below a suture. (Part of shoulder).

Reticulate - Forming a network of obliquely intersecting linear ridges.

Rib - Well-marked linear elevation of shell surface, larger and broader than a costa.

Ridge - Extended somewhat angular linear elevation on shell surface.

Sculpture - Relief pattern on shell surface; virtually identical to "ornament" and about equally used.

Selenizone - Sharply defined band parallel to coiling of whorls, which bears crescentic growth lines denoting a notch or slit in outer lip.

Shelf - Subhorizontal part of whorl surface next to a suture, bordered on side toward periphery of whorl by a sharp angulation or by a carina.

Shoulder - Salient angulation of a whorl parallel to coiling.

Side (of whorl) - Surface between shoulder, if present, and abapical suture or margin of base.

Sinistral - With genitalia on left side of head-foot mass or pallial cavity, soft parts and shell arranged as in mirror image of dextral (see dextral).

Sinus - Reentrant in outer lip with nonparallel sides.

Siphonal canal - Tubular or troughlike extension of anterior (abapical) part of apertural margin for inclosure of inhalant siphon.

Siphonal Fasciole - Distinctive band of abruptly curved growth lines near foot of columella marking successive positions of siphonal notch.

Siphonal notch - Reentrant at junction of outer and columellar lips occupied by siphon.

Siphonostomatous - With apertural margin interrupted by canal, spout or notch for protrusion of siphon.

Slit - More or less deep, parallel-sided reentrant in outer lip, which gives rise to a selenizone.

Spiral (adj.) - As applied to elements of ornament, passing continuously around whorls, almost parallel with suture.

Spiral (noun). Curved line or surface starting from point of origin and extending outward with continuously increasing radius of curvature.

Spire - Coiled gastropod shell exclusive of body whorl.

Spire angle - Angle formed by lines tangent to two or more whorls on opposite sides of shell; inasmuch as lines tangent to all whorls of the spire may define a curve, spiral angle is commonly determined by drawing straight-line tangents to lowermost whorls of spire.

Stria - Very narrowly incised shallow groove.

Suture - Spiral line of junction between surfaces of any two whorls; includes external sutures on outer side of shell and umbilical sutures within umbilicus.

Teleoconch - Entire shell exclusive of protoconch.

Thread - Fine linear surface elevation.

Trema (pl.tremata) - Perforation of shell, e.g. Haliotis, generally formed by periodic closure of a slit, but occurring also at apex of some cap-shaped shells.

Trochiform - Sides of shell evenly conical, base flat, like shell of Trochus.

Tubercle - Moderatly prominent small rounded elevation on shell surface.

Turbinate - Top-shaped, generally with rounded base.

Turreted - Very high-spired shell with flat or gently rounded base, like shell of Turritella.

Umbilical shoulder - Angulation of whorls at margin of umbilicus and within it.

Umbilicus - Central cavity of a shell formed by walls on inner sides of whorls; most common is basal umbilicus of orthostrophic conspiral shells but also included are apical umbilicus of convolute and hyperstrophic shells and lateral umbilici of planispiral (isotrophic) shells.

Umbilicate - With an umbilicus.

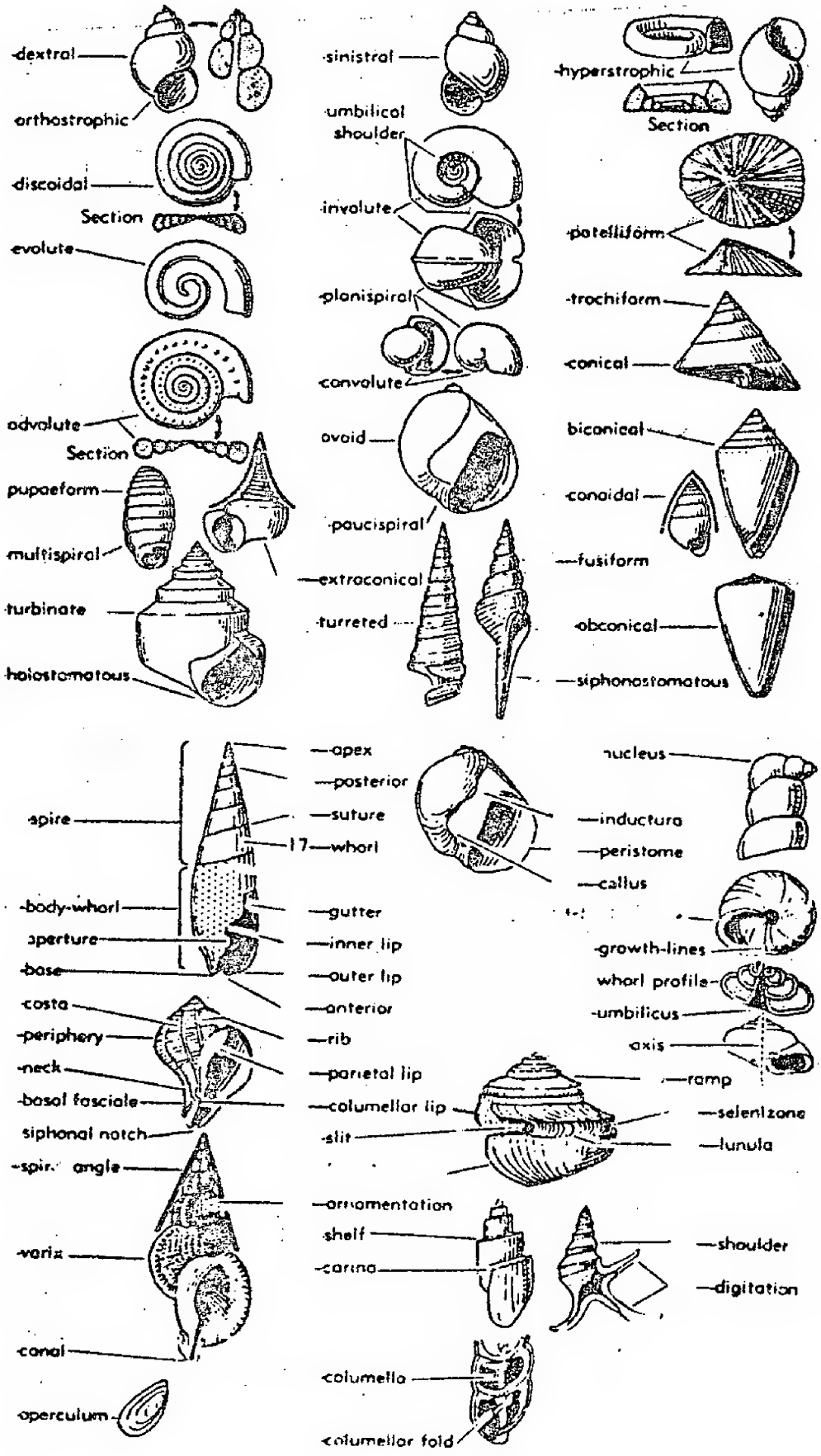
Varicose - Bearing a varix or varices.

Varix - Ridge, flange, or row of spines parallel to growth lines and marking modification of shell at former position of aperture.

Whorl - Single complete loop of a spiral shell.

Wall - Any part of framework of shell.

Wing - More or less flattened expansion of outer lip.


dextral
orthostrophic
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multispiral
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planispiral
convolute
ovoid
paucispiral
extraconical
turreted
hyperstrophic
Section
patelliform
trochiform
conical
biconical
conoidal
fusiform
obconical
siphonostomatous
apex
posterior
suture
whorl
spire
body-whorl
aperture
base
gutter
inner lip
outer lip
anterior
costa
periphery
neck
basal fasciole
siphonal notch
spir. angle
rib
parietal lip
columellar lip
slit
varix
canal
operculum
ornamentation
shelf
carina
columella
columellar fold
nucleus
inductura
peristome
callus
growth-lines
whorl profile
umbilicus
axis
ramp
selenizone
lunula
shoulder
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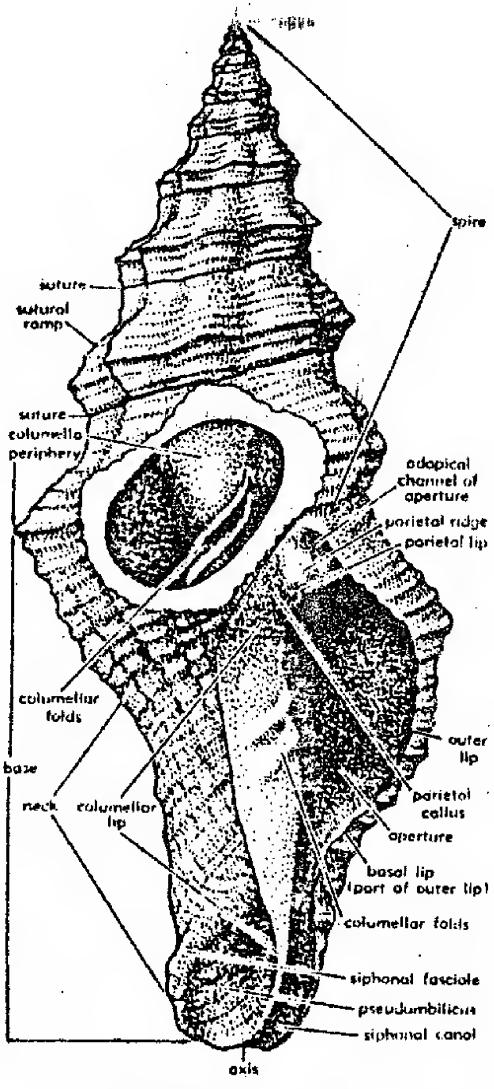
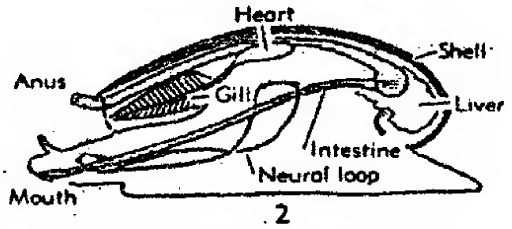


Typical gastropod shell, *Latirus lynchi* (Bartsch), Mio., Fl., showing terminology of its various parts. The columella is seen through a window" in the [illegible]



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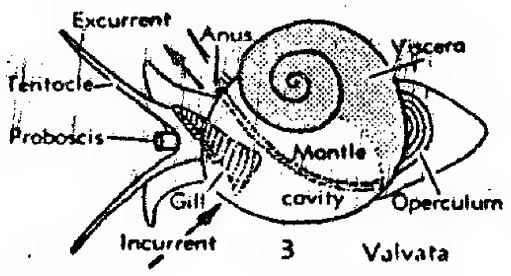
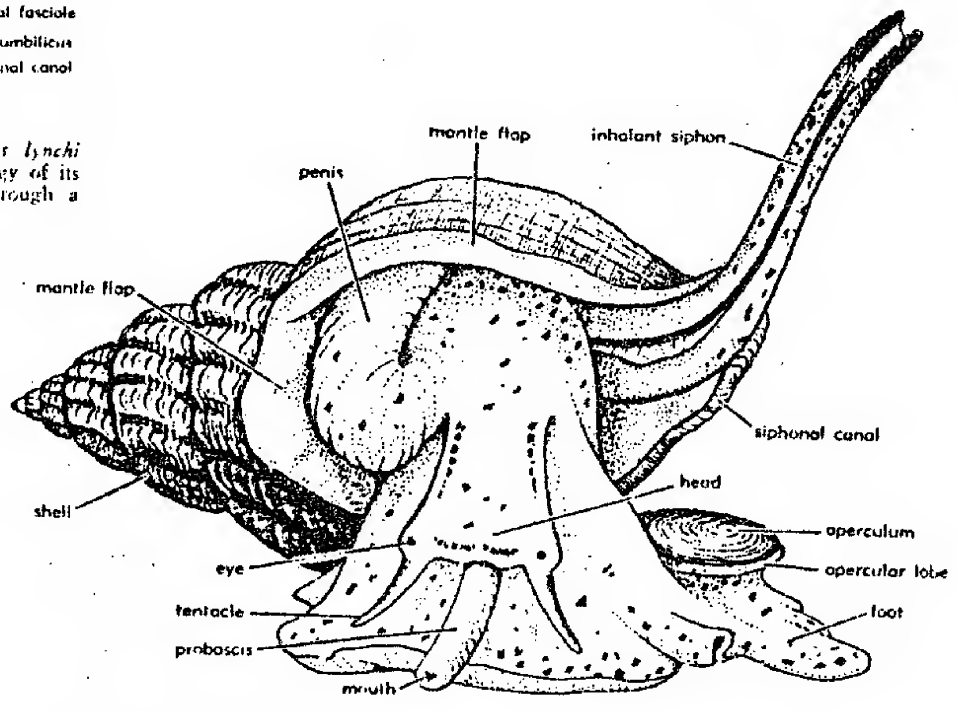


3 Valvata



Buccinum undatum Linné (♂) (115n). Shell with protruded head-foot mass; anterior view.

Useful recent books and papers on shells

Compiled by Alan Beu

This list includes only major books published since 1970 on living marine molluscs, papers in which names of New Zealand shells are changed and new species are named, and a few major papers on species of large areas.

Books

Abbott, R.T. 1973. Kingdom of the seashell. Hamlyn, New York, etc. 256 p., many col. illus. [Probably the best popular account of the biology and classification of molluscs; many excellent photos of living animals]. Expensive.

Abbott, R.T. 1975. American Seashells, second edition. Van Nostrand, New York. 663 p., 24 col. pl., ca. 5000 bl. & wh. illus. [a greatly enlarged and rewritten book; a magnificent compilation of information and pictures on North American shells]. Expensive.

Burgess, C.M. 1970. The living cowries. A.S. Barnes & Co., New York. 389 p., 44 col. pl. [The only modern account of all the world cowries. beautiful col. picture of each species; synonymises some of the over-split "species"]. Expensive.

Cernohorsky, W.O. 1972. Marine shells of the Pacific, Vol. 2. Pacific Publications, Sydney. 411 p., 68 pl. (4 col.). [An excellent, clearly illus. guide to many of the more popular families of tropical Pacific gastropods, and some species of the other main classes].

Coleman, N. 1975. What shell is that? Paul Hamlyn, Sydney. 308 p., 811 col. fig. [beautiful pictures of Australian shells of all classes, much wider coverage than in Wilson & Gillett; at least a third were photo'd in their natural environment, making this a major contribution to molluscan biology].

Dance, S.P. 1974. Encyclopedia of shells. Blandford Press, London. 290 p., well over 1000 col. illus [large number of clear col. photos of world-wide shells; the best one-book guide if you don't mind broad genera].

Keen, A.M. 1971. Sea shells of tropical West America, 2nd edition. Stanford Uni. Press, Calif. 1064 pp., 22 col. pl., more than 3300 bl. & wh. illus. [a greatly enlarged and up-dated version of the excellent 1958 book; new col. pls. 11-22 are particularly brilliant]. Expensive.

Kensley, B. 1973. Shells of southern Africa. Gastropods. Maskew Miller, Cape Town. 236 p., 910 fig.
[all illus. are watercolours, many reproduced in col. and many in bl. & wh.; by far the best guide to South African shells, although some names are wrong; a bivalve volume is proposed].

Kuroda, T., Habe, T. and Oyama, K. 1971. The sea shells of Sagami Bay, collected by His Majesty the Emperor of Japan. Maruzen, Tokyo. 741 p. (Japanese), 121 pl., 489 p. (English).
[A huge book in which most Japanese text is repeated in English; probably the most beautiful col. pl. of shells ever published; many new genera ans species named]. Expensive.

Hinton, A.G. 1972. Shells of New Guinea and the central Indo-Pacific. Jacaranda Press, Sydney, and Robt. Brown & Assoc., Port Moresby. 94 p., 44 col. pl.
[Plates are detailed and excellent; several hundred species of gastropods only; 14 pl. of Conus, the best guide ever to the genus].

Oliver, A.P.H. 1975. The Hamlyn guide to Shells of the world. Paul Hamlyn, London, etc., 320 p., many col. pl., bound in flexible plastic.
[The best value of any beginner's book on world shells; excellent watercolour illus.].

Salvat, B. and Rives, C. 1975. Coquillages de Polynésie. Editions du Pacifique, Papeete. 391 p., many illus., mostly col.
[Probably the best book ever on the biology, use and identification of molluscs; describes 446 species of French Polynesian molluscs, many endemic to the area; large chapters on nomenclature, distribution and ecology, gastropods, other classes, use by man; ALL IN FRENCH]. Expensive.

Solem, A. 1974. The shell makers: introducing mollusks. John Wiley and Sons, New York. 289 p., many illus.
[A good general guide to biology and classification of molluscs; many living animals figured; an excellent, detailed guide to land snails].

Weaver, C.E. and du Pont, J.E. 1970. The living volutes. Delaware Museum of Natural History monograph 1. 375 p., 79 col. pl.
[The only guide to world volutes; beautiful coloured pls.; many taxonomic changes proposed for N.Z. species]. Expensive.

Wilson, B.R. and Gillett, K. 1971. Australian shells. A.H. and A.W. Reed, Sydney. 168 p., 106 col. pl. [A beautiful book describing several hundred species of Australian gastropods; many excellent photos of living animals].

Papers

Beu, A.G. 1971. General of the bivalve family Mesodesmatidae, with comments on some Australasian species. Journal of the Malacological Society of Australia, 2(2) : 113-131, 11 figs. [Amphidesma becomes Paphies (Mesodesma); quoyi (Deshayes 1832) is an earlier name for forsteriana Finlay].

Beu, A.G. and Climo, F.M. 1974. Mollusca from a Recent coral community in Palliser Bay, Cook Strait. N.Z. Journal of Marine and Freshwater Research, 8(2) : 307-32, 20 fig. [Several new species].

Cernohorsky, W.O. 1970. Systematics of the families Mitridae and Volutomitridae (Mollusca : Gastropoda). Auckland Institute and Museum Bulletin 8 : 190 p., 18 pl., 222 fig. in text. [many changes; banksi goes in Volumitra].

———— 1972. Type specimens of Recent and fossil Mollusca described by H.J. Finlay, Part 1. (Scissurellidae - Turbinidae). Records of the Auckland Institute and Museum, 9 : 231-47, 20 fig.

———— 1972. Indo-Pacific Nassariidae (Mollusca : Gastropoda). Records of the Auckland Institute and Museum, 9 : 125-94, 162 figs.

———— 1973. (with W.K. Emerson). The genus Drupa in the Indo-Pacific. Indo-Pacific Mollusca, 3(13) : 1-40, 35 pl.

———— 1973. The taxonomy of Benthovoluta hilgendorfi (von Martens) and allied turbinellid genera (Mollusca : Volutacea). Records of the Auckland Institute and Museum 10 : 123-31, 16 fig. [Chathamidea expeditionis Dell placed in Surculina, Turbinellidae].

———— 1974. Type specimens of Mollusca in the University Zoological Museum, Copenhagen. Records of the Auckland Institute and Museum, 11; 143-92, 67 fig.
[several name changes for common N.Z. molluscs].

Climo, F.M. 1971. Classification of the New Zealand Arionacea. (Mollusca : Pulmonata). iv. A revision of the subfamily Otoconchinae Cockerell (Punctidae Morse). Records of the Dominion Museum, 7(6) : 43-9, 2 figs.
[A new species plus generic changes].

———— 1971. A new species of Paryphanta (Mollusca : Paryphantidae) from south-west Fiordland, New Zealand. Records of the Dominion Museum, 7(15) : 147-50, 2 fig.

———— 1971. Venustilifer bountyensis (Powell) (Mollusca : Stiliferidae). Records of the Dominion Museum, 7(14) : 143-6, 7 fig.

———— 1972. The reinstatement of Mactra murchisoni Deshayes, 1854 (Mollusca : Mactridae). Records of the Dominion Museum, 8(5) : 99-105, 3 fig.

———— 1972 (with N.B. Pullan). A taxonomic review of the family Lymnaeidae (Mollusca : Gastropoda) in New Zealand. Journal of the Royal Society of N.Z., 2(1) : 5-13, 3 fig.
[sveral name changes].

———— 1974. Description and affinities of the subterranean molluscan fauna of New Zealand. N.Z. Journal of Zoology, 1(3) : 247-84, 15 figs.
[several new genera and species].

———— 1975. The land snail fauna. pp. 459-492, 16 figs. in Kuschel, G. (Ed.) Biogeography and ecology in New Zealand. Junk, the Hague.

Garrard, T.A. 1972. A revision of Australian Recent and Tertiary Turritellidae. Journal of the Malacological Society of Australia, 2(3) : 267-338, 32 figs., pl. 26-30.

———— 1975. A revision of Australian Cancellariidae (Gastropoda : Mollusca). Records of the Australian Museum, 30(1) : 1-62, figs. 1-5.

Ponder, W.F. 1971. A review of the New Zealand neogastropod genus Paratrophon Finlay (Mollusca : Muricidae). Journal de Conchyliologie, 109(3) : 110-18, pl. 1.
[name changes; some forms reduced to subspecies].

———— 1971. A review of the New Zealand Recent and fossil species of Buccinulum Deshayes (Mollusca : Neogastropoda : Buccinidae). Journal of the Royal Society of N.Z., 1 : 231-83, 16 figs.
[Major name changes and synonymising].

Ponder, W.F. 1972. A review of the genus Xymene Iredale of New Zealand (Mollusca : Muricidae). Journal of the Royal Society of N.Z., 2(4) : 471-99, 9 fig. (Xymene = Xymenella and Axymene; several new species). (+ Zeatrophon)

———— 197.. A review of the Australian species of Penion Fischer (Neogastropoda : Buccinidae). Journal of the Malacological Society of Australia, 2(4) : 401-28, pl. 40-5 (mandarinus Duclos is an Australian species; use sulcatus (Lamarck, 1816), for N.Z. species formerly called mandarinus).

———— 1973. The origin and evolution of the Neogastropoda. Malacologia, 12(2) : 295-338, 6 fig.

———— 1975. Identity of Penion dilatatus (Quoy and Gaimard, 1833) (Mollusca : Buccinidae) (Note). N.Z. Journal of Marine and Freshwater Research, 9(4) : 569-71, 1 fig. (holotype of dilatatus is a specimen of adustus Philippi, and so adustus must be called dilatatus; uses cuvierianus Powell as name for species formerly called dilatatus).

Powell, A.W.B. 1971. New Zealand molluscan systematics, with descriptions of new species : part 7. Records of the Auckland Institute and Museum, 8: 209-28, 31 figs. (many new species and new N.Z. records).

———— 1972. A Kermadec Islands Conus (Mollusca : Gastropoda) found living in northern New Zealand waters. Records of the Auckland Institute and Museum, 9: 249-51, 1 fig.

———— 1973. The patellid limpets of the world (Patellidae). Indo-Pacific Mollusca, 3(15) : 75-206, pl. 60-182.

———— 1974. New Zealand molluscan systematics with descriptions of new species : Part 8. Records of the Auckland Institute and Museum, 11 : 197-207, 18 figs. (many new N.Z. records and name changes).

Rehder, H.A. 1973. The family Harpidae of the world. Indo-Pacific Mollusca, 3(16) : 206-74, pl. 183-247.

Rudman, W.B. 1970. A revision of the genus Philine in New Zealand with descriptions of two new species. Journal of the Malacological Society of Australia, 2(1) : 23-34, pl. 3, 2 figs.

———— 1971. The genus Bullina (Opisthobranchia, Gastropoda) in New Zealand. Journal of the Malacological Society of Australia 2(2) : 195-203, 2 figs, pl. 18.
(one new species; B. mellior (Iredale) recorded from N.Z.).

———— 1971. The family Acteonidae (Opisthobranchia, Gastropoda) in New Zealand. Journal of the Malacological Society of Australia, 2(2) : 205-14, 2 fig., pl. 19 (one new genus, several new species).

KARI KARI BAY NORTHLAND

Jean Boswell

This is a newly opened up beach as far as the general public is concerned. It is now possible for a motor car to be driven right down to the waters edge.

There must have been strong winds off the sea, on the spring tide before we arrived as there was just one continuous line of debris along the spring high tide line, mostly sea weed known to the locals as "Rimu Weed" ? this plant had been washed in, complete with holdfasts and neatly rolled into balls or long loaf like rolls.

As there were very few shells on the beach I got curious as to what might be rolled up inside these rolls of sea weed. After breaking open countless numbers of them I came to the conclusion that this particular plant must have come from an area that was the Nursery ground for Juvenile Cabestana-spengleri. I collected about three dozen of them, the largest 2 inches, smallest under $\frac{1}{2}$ inch in height. Some of them were too fragile to get out of the sea weed.

There were other varieties of small shells in numbers too numerous to count. Just to name a few, Cominella-Quoyana, Zeacolpus-pagoda, Pervicacia-tristis and three varieties of Epitoniidae. These last ones were not quite so plentiful.

By the time I had gone along most of the beach I had two very sore hands, through breaking open the rolls of sea weed. One could not be too hard or the shells would all have been broken. We returned to this same beach the next day but it had been swept clean; only a few piles of very broken common shells were to be seen.

"WHERE IS THE _____ COLLECTION OF NEW ZEALAND SHELLS"

By W.J. PAUL

A very useful book entitled "Where Is The _____ Collection", written by C.D. Sherborn, was published in 1940. This volume listed many of the important collections of shells, particularly those of authors of publications on conchology, and named the institutions in which they are preserved. An expansion of Sherborn's list was compiled by Peter S. Dance, and published in his "Shell Collecting, An Illustrated History" (1960). While these books tell us the whereabouts of the principal collections of shells on a world-wide basis, a more detailed listing of collections of New Zealand shells will be of assistance to collectors and students in this country.

The first New Zealand shells to be handled by scientists were those collected on Captain Cook's first expedition. Many of the specimens taken to England were dispersed to various people and I am not aware as to how much New Zealand material remained in the collection of Sir Joseph Banks. I have however included his collection in the list that follows.

The list is comprised of important collections made in this country and known to be in New Zealand institutions, together with a number of others which are important in the history of New Zealand conchology.

Readers may be aware of other collections worthy of inclusion in the list, and the writer will be pleased to hear of these.

Ashby E. Types in South Australian Museum, Adelaide. Chiton collection containing a quantity of N.Z.material was destroyed by fire in 1934.

Banks Sir J. In British Museum.

Bell R. Kermadec Island collection in Australian Museum, Sydney.

Beu Dr A.G. Land shells in National Museum, Wellington, remainder of collection in Geological Survey, Lower Hutt.

Bollons Capt. J. In National Museum, Wellington.

Brookes A.E. Acquired by Conchology Section of Auckland Institute and Museum as a Club Collection.

Bucknill Dr C.E.R. In Auckland Museum.

Couthoy J.P. Shells collected by the United States Exploring Expedition 1838–42 - described by A.A. Gould - parts of the collection are in United States National Museum, Washington, the Museum of Comparative Zoology, Cambridge, Mass. U.S.A., and the American Museum of Natural History, New York.

Dell Dr R.K. In National Museum, Wellington.

Dieffenbach Dr E. A collection of 58 species of shells listed by Dr J.E. Gray in appendix to Dieffenbach's "Travels in New Zealand" - in British Museum.

Finlay Dr H.J. In Auckland Museum.

Fleming Dr C.A. In N.Z. Geological Survey, Lower Hutt.

Hedley C. In Australian Museum, Sydney.

Hombron J.B. and Jacquinot C.H. Shells collected on "Astrolabe" and "Zelee" expedition in Museum d'Histoire Naturelle, Paris.

Hutton Capt. F.W. In Canterbury Museum, Christchurch.

Iredale T. In Australian Museum, Sydney ... Contains a lot on N.Z. material.

Laws C.R. Many types in N.Z. Geological Survey, Lower Hutt. The bulk of the collection in United States National Museum, Washington.

Lesson R.P. Specimens collected by the "Coquille" expedition in Museum d'Histoire Naturelle, Paris.

Mestayer Miss M. New Zealand shells ... in National Museum, Wellington. Foreign shells were disposed of privately.

Murdoch R. Destroyed by fire while owner absent overseas.

O'Connor C. Collection of land shells, mainly Paryphantas, in National Museum, Wellington.

Oliver Dr R.W.B. In National Museum, Wellington.

Ponder Dr W.F. In National Museum, Wellington.

Powell Dr A.W.B. In Auckland Museum. Types of new species named in "Discovery Reports" in British Museum.

Sinclair Dr A. A collection made by Dr Sinclair was sent to the British Museum in 1842 by Dr Stanger. Dr Sinclair's main collection was taken to the British Museum by Mr Justice Gillies in 1886.

Smith Mrs E. A large collection of Stewart Island shells in National Museum, Wellington.

Smith E.A. Shells collected by the "Erebus" and "Terror" expedition - types in British Museum.

Strange F. Shells collected by the "Acheron" expedition 1847-49 were purchased by Hugh Cuming - Cuming collection is in British Museum.

Suter H. Collection was purchased by the Wanganui Museum. It was later purchased from the Wanganui Museum by the N.Z. Geological Survey. The land and fresh water shells were transferred to the National Museum, Wellington.

Tomlin J.R. le B. In Cardiff Museum, Wales. Collection contains a quantity of Sub-Antarctic material.

Watson R.B. "Challenger" collections in British Museum.

Yate Rev. W. A collection from the east coast of N.Z. in British Museum - this collection was listed by Dr J.E. Gray in the appendix to Yate's "Account of New Zealand" (this book was recently reprinted).